4. PRODUCTION, IMPORT/EXPORT, USE, AND DISPOSAL

4.1 PRODUCTION

Table 4-1 lists the number of facilities in each state that manufacture or process phenol, the intended use, and the range of maximum amounts of phenol that are stored onsite. The data listed in Table 4-1 are derived from the Toxics Release Inventory (TRI) (TRI96 1998). Only certain types of facilities were required to report. Therefore, this is not an exhaustive list.

Phenol has been obtained by distillation from petroleum and synthesis by oxidation of cumene or toluene, and by vapor-phase hydrolysis of chlorobenzene (USITC 1987). In 1995, 95% of U.S. phenol production was based on oxidation of cumene except at one company that used toluene oxidation and a few companies that distilled phenol from petroleum (CMR 1996). In 1995 the total annual capacity of phenol production approached 4.5 billion pounds (CMR 1996).

4.2 IMPORT/EXPORT

According to the National Trade Data Bank (1996), imports of phenol were 28.7 million kg (63.1 million pounds) and exports of phenol were 138.2 million kg (304 million pounds) in 1995.

4.3 USE

The two major uses of phenol in 1995 were the production of bisphenol-A (35%) and the production of phenolic resins (34%) (CMR 1996). The largest use for bisphenol-A is as an intermediate in the production of epoxy resins (Thurman 1982). Phenol-formaldehyde resins comprise over 95% of this market (Thurman 1982). The plywood adhesive industry required 26% of the total production of phenolic resins in 1977. These low-cost, versatile, thermoset resins have other major uses in the construction, automotive, and appliance industries (Thurman 1982).

Other major uses of phenol include the production of caprolactam (15%), aniline (5%), alkylphenols (5%), xylenols (5%), and miscellaneous uses (1%) (CMR 1996). Phenol is used as a slimicide (a chemical toxic to bacteria and fungi characteristic of aqueous slimes) and as a general disinfectant in solution or mixed with

Table 4-1. Facilities that Manufacture or Process Phenol

State[a]	Number of Facilities	Range of Maxumum Amounts on Site in Pounds[b]	Activities and Uses[c]
AL	31	0–49,999,999	1, 5, 6, 7, 8, 9, 12, 13
AR	14	0–9,999,999	1, 2, 5, 6, 7, 8, 9, 11, 13
AZ	4	100–99,999	8, 12, 13
CA	24	100–9,999,999	1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 13
CO	1	1,000–9,999	12
CT	8	100–99,999	7, 8, 9, 12, 13
DE	1	10,000–99,999	7
FL	10	100–999,999	1, 6, 7, 9, 13
GA	27	0–999,999	1, 2, 3, 5, 6, 7, 8, 9, 11, 13
IA	8	0–99,999	7, 9, 11, 12
ID	1	100–999	1, 6
IL	36	0–9,999,999	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
IN	33	100–49,999,999	1, 2, 3, 4, 5, 7, 8, 9, 11, 12, 13
KS	8	0–9,999,999	1, 4, 5, 6, 7, 8, 9, 12
KY	11	100–9,999,999	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
LA	28	100–99,999,999	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13
MA	8	1,000–99,999	7, 8, 9, 12
MD	2	100–99,999	1, 6, 7, 8, 9
ME	7	100–99,999	1, 2, 5, 6, 7, 8, 13
MI	32	0–9,999,999	1, 5, 6, 7, 8, 9, 11, 12, 13
MN	10	1,000–9,999,999	1, 5, 6, 7, 8, 9, 12
MO	10	0–999,999	7, 8, 10, 11, 12, 13
MS	19	0–999,999	1, 5, 6, 7, 9, 12, 13
MT	2	1,000–999,999	1, 6, 7
NC	26	100–9,999,999	1, 5, 6, 7, 8, 9, 11, 12, 13
NE	3	1,000–99,999	7, 9, 12
NH	3	100–99,999	1, 6, 12
NJ	9	0–9,999,999	1, 3, 5, 6, 7, 8, 13
NY	21	100–9,999,999	1, 2, 3, 5, 6, 7, 8, 9, 12, 13
OH	57	0–49,999,999	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
OK	8	100–99,999	1, 5, 6, 8, 9, 11, 12, 13
OR	18	100–9,999,999	1, 6, 7, 8, 9, 12
PA	33	0–99,999,999	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
PR	1	1,000–9,999	9
RI	2	1,000–99,999	7, 8
SC	25	0–9,999,999	1, 5, 6, 7, 8, 10, 11, 13
TN	17	100–99,999	1, 5, 6, 7, 8, 9, 11, 12, 13
TX	66	100–99,999,999	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
UT	3	1,000–999,999	1, 3, 5, 6, 7, 11, 13
VA	18	0–49,999,999	1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 13
VI	1	1,000–9,999	1, 2, 3, 4, 5, 7
VT	1	1,000–9,999	2, 3, 9, 11

Table 4–1. Facilities that Manufacture or Process Phenol (*continued*)

State[a]	Number of Facilities	Range of Maxumum Amounts on Site in Pounds[b]	Activities and Uses[c]
WA	12	0–9,999,999	1, 3, 4, 5, 6, 7, 8
WI	30	100–9,999,999	1, 5, 6, 7, 8 , 9, 11, 12, 13
WV	7	1,000–9,999,999	1, 3, 5, 6, 7, 8, 9
WY	2	100–99,999	1, 4, 5, 6

Source: TRI96 1998

a Post office state abbreviations used

b Range represents maximum amounts on site reported by facilities in each state

c Activities/Uses:

1. Produce
2. Import
3. Onsite
4. Sale/Distribution
5. Byproduct
6. Impurity
7. Reactant
8. Formulation Component
9. Article Component
10. Repackaging
11. Chemical Processing Aid use/processing
12. Manufacturing Aid
13. Ancillary/Other Uses

slaked lime for toilets, stables, cesspools, floors, drains, and other areas (Budavari et al. 1989; Hawley 1981). Phenol is used in medicinal preparations including ointments, ear and nose drops, cold sore lotions, mouthwashes, gargles, toothache drops, analgesic rubs (Douglas 1972), throat lozenges (EPA 1980), and antiseptic lotions (Musto et al. 1977).

4.4 DISPOSAL

Phenol is listed as a toxic substance under Section 313 of the Emergency Planning and Community Right to Know Act (EPCRA) under Title III of the Superfund Amendments and Reauthorization Act (SARA) (EPA 1998c). Disposal of wastes containing phenol is controlled by a number of federal regulations (see Chapter 7).

Phenol may be disposed of by controlled burning or by feeding dilute amounts to sewage organisms. Because shock loadings will be fatal to organisms, sludge acclimation is generally required for efficient digestion by bacteria. Potassium permanganate (100–500 ppm) can be used to disrupt the structure of phenol, forming aliphatic acids (OHM/TADS 1988). Phenol can be recovered economically from solutions of greater than 1% phenol by steam stripping, distillation, or adsorption onto carbon (OHM/TADS 1988).

According to the TRI, about 8.5 million pounds (3.8 million kg) of phenol were transferred to landfills and/or other treatment facilities, and about 3.3 million pounds (1.5 million kg) were sent to publicly-owned treatment works (POTWs) in 1996 (see Table 5-1) (TRI96 1998).